Prepared by CABI and EPPO for the EU under Contract 90/399003

Data Sheets on Quarantine Pests

Unaspis citri

IDENTITY

Name: *Unaspis citri* (Comstock)
Synonyms: *Chionaspis citri* Comstock
Prontaspis citri (Comstock)
Dinaspis veitchi Green & Laing
Taxonomic position: Insecta: Hemiptera: Homoptera: Diaspididae
Common names: Citrus snow scale, white louse scale (English)
Schneeweisse Citrusschildlaus (German)
Cochinilla blanca, piojo bianco, escama de nieve de los cítricos (Spanish)
Bayer computer code: UNASCI
EPPO A1 list: No. 226
EU Annex designation: II/A1

HOSTS

U. citri is polyphagous, attacking plant species belonging to 12 genera in 9 families. The main hosts of economic importance are *Citrus* spp., especially oranges (*C. sinensis*) but the insect has also been recorded on a wide range of other crops, mostly fruit crops and ornamentals, including *Annona muricata*, bananas (*Musa paradisiaca*), *Capsicum*, coconuts (*Cocos nucifera*), guavas (*Psidium guajava*), *Hibiscus*, jackfruits (*Artocarpus heterophyllus*), kumquats (*Fortunella*), pineapples (*Ananas comosus*), *Poncirus trifoliata* and *Tillandsia usneoides*.

The main potential hosts in the EPPO region are *Citrus* spp. growing in the southern part of the region, around the Mediterranean.

GEOGRAPHICAL DISTRIBUTION

U. citri originated in Asia and has spread widely in tropical and subtropical regions.
EPPO region: A closely related species, the arrowhead scale (*Unaspis yanonensis* (Kuwana)), also a pest of citrus, has recently been introduced into France and possibly into Italy (EPPO/CABI, 1996). Specimens of *U. citri* were collected in Portugal (Azores) in the 1920s, but there have been no records since; there is no suggestion that the pest is established there now. There has recently been an isolated record in Malta.
Asia: China (Guangdong, Hubei), Hong Kong, Indonesia (Java), Malaysia (Peninsular), Singapore, Viet Nam.
Africa: Benin, Cameroon, Congo, Côte d'Ivoire, Gabon, Guinea, Mauritius, Niger, Nigeria, Senegal, Sierra Leone, Togo, Zaire.
North America: Bermuda, Mexico, USA (California, Florida, Georgia, Louisiana).
Central America and Caribbean: Antigua and Barbuda, Barbados, British Virgin Islands, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Haiti,

Honduras, Jamaica, Montserrat, Panama, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Trinidad and Tobago, United States Virgin Islands.
South America: Argentina, Bolivia, Brazil (Rio Grande do Sul, Rio de Janeiro, São Paulo), Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela.
Oceania: Australia (New South Wales, Queensland, South Australia, Victoria), Cook Islands, Fiji, Kiribati, New Caledonia, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands (Stapley, 1976), Tonga, Vanuatu, Wallis and Futuna.
EU: Absent.
Distribution map: See CIE (1962, No. 149).

BIOLOGY

U. citri is sexually reproductive and produces several overlapping generations a year (up to 9, according to Davidson & Miller, 1990). The active first instars are most abundant during late spring, summer and autumn, and populations tend to peak in numbers in late autumn. The life cycle takes 10 to 12 weeks to complete during the summer but longer during cooler weather. Each female can produce up to 169 first instars (over a period of 146 days); the average number of offspring per female is about 80. For a short period after hatching, the first instars are attracted to light and move upwards towards the apical twigs or on to the fruit, especially if leaf fall has occurred. Once a feeding site has been selected the females and immature males become sessile (Hely *et al.*, 1982).

Laboratory studies of the population dynamics of *U. citri* showed the net reproductive rate, intrinsic rate of increase and finite rate of increase was higher on orange than on lemon. The longevity of female scales on orange was approximately 13 weeks compared to 17 weeks on lemon (Fern ndez & García, 1988a). Population studies in Colombia have shown that at any given time, 86.5 to 95.5% of *U. citri* are not feeding and that 43.9 to 79.3% of first instars are male which cease to feed after the second moult (Mosquera, 1979).

DETECTION AND IDENTIFICATION

Symptoms

Infestations of *U. citri* usually occur on the trunk and main limbs of trees under 10 years old. Heavy infestations spread to the twigs, leaves and fruit. This results in yellow spotting on the undersides of leaves which drop prematurely, dieback of twigs and weakening and eventual killing of branches. Heavily infested bark becomes dark, dull, hard, appears tight and subsequently splits. Weakened limbs and twigs become infected with fungi and may be subsequently attacked by wood-boring insects.

The small size, dark colour and sessile nature of the female scales makes them difficult to detect unless present in large numbers. In contrast the large white masses of male scales are conspicuous, hence the common name of 'citrus snow scale'. On citrus fruit, the female scales can be confused with the common *Lepidosaphes* spp. or easily overlooked as dirt particles.

Morphology

The adult female scales are mussel or oyster-shell shaped, brown or brown-black with a lighter coloured margin, moderately convex and often have a distinct longitudinal dorsal ridge. The exuviae are terminal and brownish-yellow. The scales attain a length of 2.25 mm. The male scales are white, felted, elongate, slender, oval with three longitudinal ridges. The exuviae are terminal and brownish-yellow.

Authoritative identification involves detailed microscopic examination of teneral adult females by a competent taxonomist. *U. citri* should be distinguished from *U. yanonensis*

which occurs throughout south-east Asia and Australia, and also in south-east France. Adult females of *U. citri* have relatively few pygidial dorsal ducts, do not have marked divisions between the thoracic segments and have subjacent median lobes. Adult females of *U. yanonensis* have numerous pygidial dorsal ducts, usually have marked divisions between the thoracic segments and distinct median lobes. Detailed morphological descriptions, illustrations and keys are provided by Balachowsky (1954), Ferris (1937) and Williams & Watson (1988).

MEANS OF MOVEMENT AND DISPERSAL

Like other diaspidids, the main dispersal stage is the first instar which may be naturally dispersed by wind and animals. Once a feeding site has been selected the insect becomes sessile and is not naturally dispersed. However, it is readily carried on consignments of plant material and fruits. It has often been intercepted on imported citrus fruits.

PEST SIGNIFICANCE

Economic impact

U. citri is one of the principal pests of *Citrus* spp. in many of the citrus-growing regions of the world, especially in the tropics. It infests the trunk, branches and small shoots causing serious damage to orchards due to leaf drop and rapid dieback. Relatively low numbers of scales can cause damage.

Control

Chemical control is possible but the waxy surfaces, sessile nature, intermittent feeding and overlapping generations of *U. citri* makes it difficult. In Cuba, the insecticides sulphur, carbaryl, dimethoate, malathion and omethoate are commonly used (Castineiras & Obregon, 1986). In laboratory and field trials, mineral oil or mineral oil/dimethoate mixture was found to be the most effective against the mobile stages and against the general population, omethoate was the most effective against mature females (Fernández & Rodríguez, 1988b). In tests in Venezuela an emulsion spray of parathion (or chlorfenvinphos), white oil and water (0.4:3:200 by volume) kept a citrus orchard free from *U. citri* for 2-3 months (Servicio para el Agricultor, 1973).

Existing biological control agents include the hymenopterous parasitoids Aphytis lingnanensis used in Florida (USA), Argentina, Solomon Islands and Cuba and *Encarsia lounsburyi* in Cuba. Construction of field cages to enclose citrus trees has facilitated the release and establishment of *A. lingnanensis* in citrus groves in Florida (Brooks & Vitelli, 1976). In Australia a predatory caterpillar, *Batrachedra* sp., causes spectacular reductions in the number of scales whenever populations become dense (Hely *et al.*, 1982).

U. citri increased greatly in numbers after 1963 in Florida and was not effectively suppressed by biological methods. High-volume pesticide sprays were required for control (Simanton, 1976).

Phytosanitary risk

U. citri has recentlly been added to the EPPO A1 list but is not considered as a quarantine pest by any other regional plant protection organization. It appears on the quarantine pest list of Russia. The related *U. yanonensis* is already an A2 quarantine pest, but has not been accepted by the EU as a listed quarantine pest. *U. citri* presents a certain threat to the citrus industry throughout the Mediterranean area, but it is a more tropical species than *U. yanonensis*. For example, while *U. yanonensis* is widespread in Japan, *U. citri* does not occur at all. Vilardebo (1974) noted that, in West Africa, *U. citri* is confined to the humid tropical zone along the coast and does not occur where there is a dry season. Maelzer

(1979) similarly noted that *U. citri* is confined to the non-irrigated humid coastal regions of Queensland and New South Wales, in Australia, and does not occur in the semi-arid irrigated citrus cultivation areas inland, where *Aonidiella aurantii* is abundant (a situation thus resembling the Mediterranean). *U. citri* also has less of a tendency to attack fruits. Like *U. yanonensis*, it is probably subject to adequate control by biological methods. On balance, it probably presents a lesser risk of establishment and damage than *U. yanonensis*. Nevertheless, it is a significant pest which should be excluded from the EPPO region.

PHYTOSANITARY MEASURES

Importation of *Citrus* plants for planting is already prohibited or restricted on account of other important pests. Fruits should be subject to requirements such as area freedom, place of production freedom or treatment.

BIBLIOGRAPHY

Balachowsky, A.S. (1954) *Les cochenilles paléarctiques de la tribu des Diaspidini*, 450 pp. Institut Pasteur, Paris, France.

Brooks, R.F.; Vitelli, M.A. (1976) An easily erected tree cage for introducing insect parasites. *Florida Entomologist* **59**, 67-70.

Castineiras, A.; Obregon, O. (1986) [Toxicity of six pesticides on *Citrus* crops against *Aspidiotiphagus lounsburyi*]. *Ciencia y Técnica en la Agricultura, Protección de Plantas* **9**, 73-79.

CIE (1962) *Distribution Maps of Pests, Series A* No. 149.
CAB International, Wallingford, UK.

Davidson, J.H.; Miller, D.R. (1990) In: *Armored scale insects* (Ed. Roosen, D.) pp. 603-632. World Crop Pests Vol. 4B. Elsevier, Amsterdam, Netherlands.

EPPO/CABI (1992) *Unaspis yanonensis*. In: *Quarantine pests for Europe*. 2nd edition (Ed. by Smith, I.M.; McNamara, D.G.; Scott, P.R.; Holderness, M.). CAB INTERNATIONAL, Wallingford, UK.

Fernández, M.; García, G. (1988a) Population parameters of *Unaspis citri* (Homoptera: Diaspididae). *Revista de Protección Vegetal* **3**, 198-200.

Fernández, M.; Rodríguez, M.E. (1988b) Effectivity of five products in the chemical control of *Unaspis citri* (Homoptera: Diaspididae). *Revista de Protección Vegetal* **3**, 45-52.

Ferris, G.F. (1937) *Atlas of the scale insects of North America (Series 1, Vol. 1)*. Serial Nos. SI-1 to SI-136. Stanford University Press, California, USA.

Hely, P.C.; Pasfield, G.; Gellatley, J.G. (1982) *Insect pests of fruit and vegetables in New South Wales*, 312 pp. Inkata Press, Melbourne, Australia.

Maelzer, D.A. (1979) The current status of the biological control of insect pests of citrus in Australia. *Australian Applied Entomological Research Conference, Lawes, Queensland, June 1979*, pp. 236-240. CSIRO, Canberra, Australia.

Mosquera, P.F. (1979) Some observations on the economic importance of the citrus snow scale, *Unaspis citri*. *Revista Colombiana de Entomologia* **5**, 53-56.

Servicio para el Agricultor (1973) Control of the *Citrus* pests. *Noticias Agrícolas* **6**, 26, 106.

Simanton, W.A. (1976) Occurrence of insect and mite pests of citrus, their predators and parasitism in relation to spraying operations. *Proceedings, Tall Timbers Conference on Ecological Animal Control by Habitat Management* No. 6, pp. 135-163. Tall Timbers Research Station, Gainesville, USA.

Stapley, J.H. (1976) Annual report of entomologist for 1976. *Report, Ministry of Agriculture and Lands, Solomon Islands*, 28 pp.

Vilardebo, A. (1974) Les cochenilles des agrumes dans l'Ouest africain. Répartition et développement en relation avec la climatologie. *Bulletin SROP* 1974/3, 67-78.

Williams, D.J.; Watson, G.W. (1988) *The scale insects of the tropical South Pacific region. Part 1. The armoured scales (Diaspididae)*, 290 pp. CAB International, Wallingford, UK.